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BARBERRY ERADICATION IN STEM RUST CONTROL



- WHEAT
- OATS
- BARLEY
- RYE

Leaflet No. 416

UNITED STATES DEPARTMENT OF AGRICULTURE

BARBERRY ERADICATION IN STEM RUST CONTROL

Certain species of barberry spread stem rust—a disease of wheat, oats, barley, and rye. Federal, State, and local agencies in 19 States are cooperating in a program to eradicate these rust-spreading plants.

STEM RUST

Stem rust is a fungus disease that costs us millions of dollars each year. It has reduced grain yields by 200 million bushels in a single season. Damage from stem rust occurs in some areas every year.

Rust, growing on green stems and leaves, uses water and food needed by the plant to develop grain kernels. The kernels from rusted plants are badly shriveled. Some become light and chaffy; others fail to develop to normal size. Rusted stems turn grayish brown, become dry and brittle, and often break over.

Stem rust appears as pustules, or blisters, that break through the surface of plant stems, leaves, and sheaths after 7 to 10 days of devel-

opment. The pustules develop in warm, moist weather. A single pustule may produce 350,000 spores.

A pustule produces two kinds of spores—red spores, which are summer rust, and black spores, which are winter rust.

Summer Rust

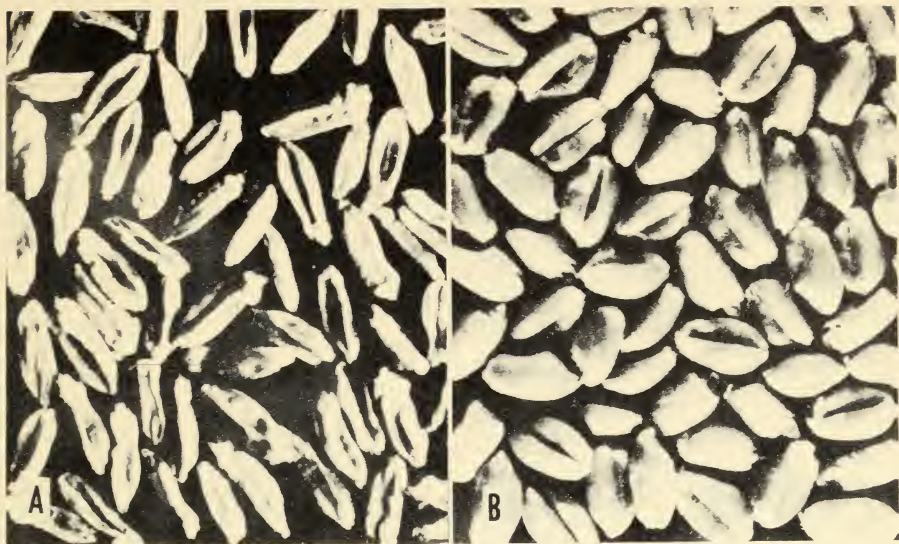
The red spores develop on the growing grain and grass plants and are carried by the wind to other young plants. There they may germinate in an hour in warm, humid weather. The fungus grows and the spores spread rapidly from plant to plant and from field to field until harvesttime if temperature and moisture conditions remain favorable.

Winter Rust and the Barberry

Thick-walled black spores, produced on the maturing grain, are not blown about by the wind, but remain on stubble, straw, and wild grasses through the winter. These spores germinate in early spring and infect barberry bushes.

After a week or 10 days, cuplike growths develop from the fungus

This leaflet explains how barberry bushes spread stem rust and how to identify the rust-spreading species. Learn to identify these species and you can help in the stem rust control program. Report the location of rust-spreading barberry bushes to your county agricultural agent, State agricultural college, or State department of agriculture.



BE-154

Wheat from rust-infected plants (A), and rust-free plants (B).

spores on the underside of barberry leaves. The cups mature and shoot spores into the air to be scattered by the wind. Billions of spores may be produced on one barberry bush. When these spores fall on grain plants, they germinate and grow into the stems. Within 10 days, rust spots filled with red spores are produced.

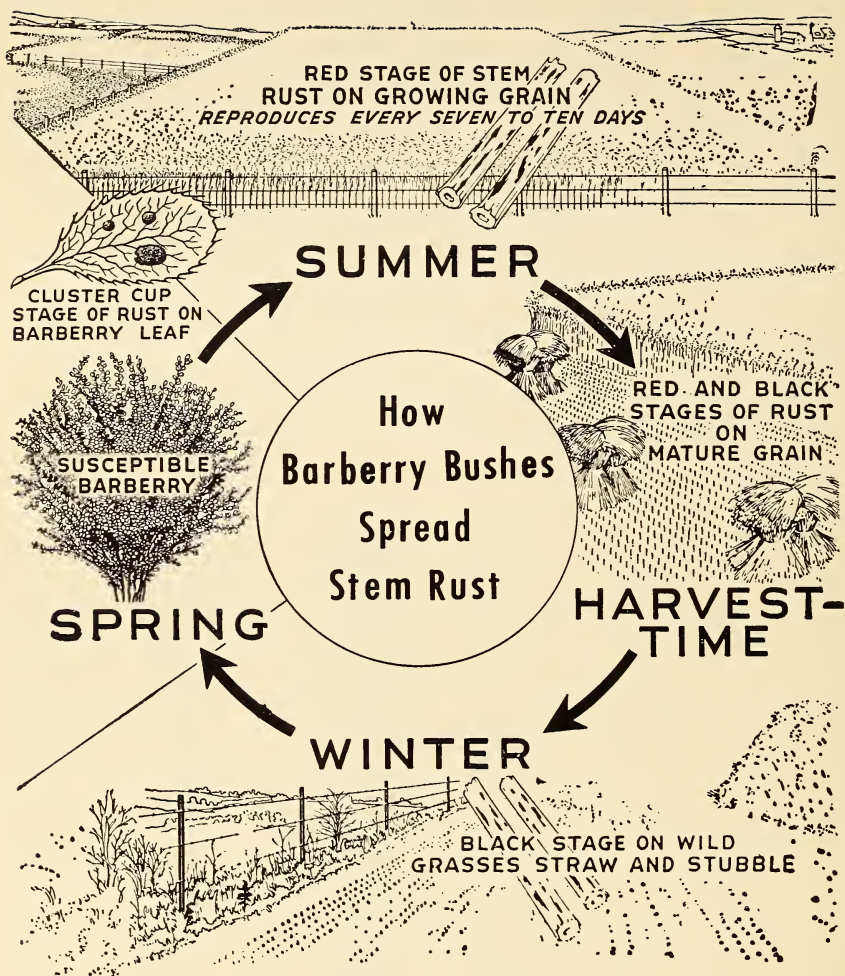
Stem rust spread by barberry is particularly damaging because it infects the grain 2 or 3 weeks before rust spores are carried by the wind from the south into the northern States. With this early start, rust can severely damage the young plants.

Stem rust infections caused by spread of spores directly from barberry begin as local infection centers on nearby grains and grasses: usually these local rust spreads can be traced only a few miles. From these local infection centers, however, the rust often spreads over large areas.



BE-887

Stems of grain plants infected with stem rust.



RACES

Wheat, oats, and rye are each attacked by a different variety of stem rust. The wheat variety also attacks barley. Each variety is made up of many different physiologic forms called races.

Scientists have identified more than 200 races of stem rust that develop on wheat. They have found

at least 14 races on oats and 14 more on rye. Races differ in their ability to attack different varieties of grain. Thus, a certain variety of grain may appear to be completely resistant to stem rust until exposed to a race to which it is susceptible.

Races hybridize on the barberry and develop new races. These may attack varieties of grain that previously were resistant to stem rust.

Many more races appear in localities where barberries are numerous than in localities free of these bushes. Forty-three races were isolated from a single spread of rust from barberry to wheatfields in Pennsylvania.

Rust spores carried by the wind between northern and southern States and between Mexico, the United States, and Canada make barberry eradication an interstate and international problem. A new race of rust produced on barberry in northern States may be blown south and infect grainfields in southern Texas and Mexico. From these infection centers, spores spread to other fields, to other States, and to other regions.

Rust that overwinters in southern Texas and in Mexico may damage crops in northern States only under a combination of conditions: (1) Stem rust is abundant in the South; (2) winds from the south carry spores to the northern grainfields several weeks before the crops mature; (3) crops in the North are susceptible to the particular rust present; (4) weather conditions in northern States favor the development and spread of the fungus.

LOCAL SPREADS

Hundreds of rust spreads from barberry bushes to grains and grasses have been recorded. In Pennsylvania, spores spread from barberry bushes to wheatfields and caused a stem rust epidemic that covered more than 400 square miles. By harvesttime, 200,000 bushels of wheat had been destroyed and farm income in that area reduced by \$300,000.



BE-112

Stem rust on underleaf surfaces of barberry.

In Indiana, rust from one barberry bush destroyed \$50,000 worth of grain in a single year.

In the Palouse area of Washington, nearly a quarter of a million bushels of wheat were lost in a single year because of stem rust that spread from barberry bushes. This epidemic spread directly from thousands of barberry bushes growing next to wheatfields.

Farmers in Virginia reported a 68-percent increase in wheat yields after barberry bushes were destroyed on their farms, and 168 farmers in northeastern Pennsylvania reported that their yields of oats were increased by 123 percent following the destruction of barberry.

HARMFUL BARBERRY



← **Edge of Leaves** →
Saw Toothed Smooth

← **Bark** →
Outer - Gray Outer - Reddish Brown
Inner - Bright Yellow Inner - Bright Yellow

← **Berries** →
In Bunches Single or
Like Currants in Twos

← **Spines** →
Usually Usually
Three in Group Single

HARMLESS BARBERRY



CONTROL PROGRAM

Barberry bushes produce abundant seed, which are scattered by birds. Seeds may germinate after more than 10 years. Areas where rust-spreading bushes have been destroyed must be reworked at intervals of 5 to 8 years until there is no further regrowth.

Nineteen States are cooperating with the Federal Government to eradicate barberry. Since the control program began in 1918, more than 500 million bushes have been destroyed.

Eradication has reduced the number of local sources of stem rust. Fewer new, destructive races of rust will originate in the future. The bushes destroyed could have produced millions more from seed. Without an eradication program, these would be widely distributed

and local rust epidemics initiated by them would affect almost every community in the infested States.

HOW YOU CAN HELP

Barberry eradication is one of the important methods of controlling stem rust. You can help yourself and your neighbors by destroying harmful barberry bushes.

How To Identify Barberry

Many species of barberry bushes grow in the United States. Some spread rust; others do not.

RUST-SPREADING BARBERRIES.—The European, or common, barberry is the most widespread. It was brought to America by colonists and taken westward by early settlers. It has since grown wild over most of the northern grain-producing areas.

Plant approved rust-resistant or early-maturing varieties of grain. Ask your county agricultural agent about grain varieties best suited to your locality.



BE-548

Spraying barberry with chemicals.

It is an erect bush, normally 6 to 12 feet tall. Its leaves are spoon shaped and have spiny edges. There are both green- and purple-leafed varieties. The outer bark of the stems is gray. Spines usually grow three in a group. Oval-shaped berries hang in clusters like currants; they turn red in late summer.

Two species of native barberry also spread stem rust. The Alleghany barberry grows in Virginia and West Virginia and the Colorado barberry is found in southwestern Colorado. These species are like the European barberry ex-

cept that they are low shrubs and grow in clumps or patches.

HARMLESS BARBERRIES. — Many species of barberry do not harbor stem rust. The Japanese barberry is commonly grown for ornamental planting. It is a low, spreading shrub, usually not more than 4 feet high. Its leaves are small and have smooth edges. The outer bark of the stems is reddish brown. The spines are usually single, and bright-red, oval berries are produced singly or in groups of 2 or 3.

Some widely used species are *Berberis thunbergi* (green-leaf Japanese), *B. thunbergi atropurpurea*



BE-873

Applying ammonium sulfamate to cut stubs of barberry canes.

(red-leaf Japanese), and *B. mentorensis* (Mentor barberry). These and other rust-resistant species are not a rust hazard.

State and Federal quarantines regulate the sale of barberry. Nursery-grown bushes are inspected to make sure that rust-susceptible species are not propagated or sold.

How To Kill Barberry Bushes

It is difficult to kill barberry bushes by digging, because fragments of roots left in the soil may sprout and produce new plants.

Common salt, poured on and around the crowns, kills barberry. Apply 10 to 15 pounds for each square foot of crown area. Lightly sprinkle salt around the canes of native barberry to kill them. Do not use salt where it will harm nearby plants or endanger livestock.

Ammonium sulfamate (*Ammate*) is particularly useful in killing widely scattered barberry bushes. Cut off canes close to the ground and apply the dry chemical to the freshly cut surfaces. The small amount that can be placed on the cane stubs is enough to kill the bush. A pound will kill several medium sized bushes. Do not let this chemical contact adjoining plants.

Hormone-type herbicides (2,4-L and 2,4,5-) used as sprays, are effective against both the native and European species. Ask your county agricultural agent for information on how to kill barberry by spraying with chemicals. Observe the precautions recommended in handling and applying herbicides.

Prepared by

PLANT PEST CONTROL DIVISION
AGRICULTURAL RESEARCH SERVICE

This leaflet supersedes Farmers' Bulletin 2014, Kill Barberry Bushes That Spread Stem Rust to Grains.

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